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ABSTRACT

This study investigated the effectiveness of the neurological impress method (NIM), the language experience approach (LEA), and classroom teaching as remedial reading treatments for disabled readers. Subjects referred to the Purdue Reading Clinic were screened to determine whether they met criteria for the study and were randomly assigned to the NIM, LEA, or control (classroom teaching) treatment. Tutors were also randomly assigned to either the NIM or LEA treatment. They were trained in the experimental and other instructional methods and were supervised in their use of remedial procedures. Reading progress during one semester or summer session was measured with oral and silent reading subtests. An analysis of covariance revealed that for all twelve reading measures no statistically significant differences were found among treatment groups. Growth in reading, however, was evidenced in all treatment groups. (Author/TO)

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A COMPARISON OF THE NEUROLOGICAL IMPRESS METHOD, THE LANGUAGE EXPERIENCE APPROACH, AND CLASSROOM TEACHING FOR CHILDREN WITH READING DISABILITIES

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SUMMARY

The purpose of this study was to investigate the effectiveness of the Neurological Impress Method (NIM), the Language Experience Approach (LEA) and classroom teaching as remedial reading treatments for disabled readers.

The NIM is reportedly a remedial technique involving multisensory learning modalities. Evidence of its effectiveness is extremely limited. Although the LEA has been used for many years as a remedial technique, empirical evidence is conflicting.

Subjects referred to the Purdue Reading Clinic were screened to meet criteria for the study and were randomly assigned to the NIM, LEA, or Control treatment. Tutors were also randomly assigned to either the NIM or LEA treatment. They were trained in the experimental and other instructional methods and supervised in their use of remedial procedures. Reading progress during one Purdue semester or summer session was measured with oral and silent reading subtests. Analysis of covariance was used to test the statistical significance of differences in scores attained by the three groups.

Results of analysis of covariance revealed that for all twelve reading measures no statistically significant differences were found among treatment groups. Growth in reading, however, was evidenced in all treatment groups. It can be concluded that neither the NIM nor the LEA nor the control treatment was a more effective instructional procedure than either of the others.

The primary implication of this study is that for disabled readers in general, there is probably no one best method of instruction. This implication is consistent with results of many studies involving typical school populations.

CHAPTER I

INTRODUCTION AND RELATED LITERATURE

Introduction

The purpose of this study was to investigate the effectiveness of the Neurological Impress Method, when compared to the Language Experience Approach, for remedial reading instruction. A control group receiving no experimental remedial reading treatment was also used.

The Neurological Impress Method recently developed by Heckelman (1966) purportedly is a remedial technique involving multi-sensory learning modalities. It involves unison oral reading by therapist and client to provide an accurate model of oral reading and reinforcement of the client's word recognition. The index finger of both is used to follow the print to facilitate focus and visual tracking and to provide large muscle emphasis for patterns of eye muscle movement.

The Language Experience Approach involves a client's dictating a reaction to an experience, the therapist's recording the reaction in the client's own language, and the client's reading the written form of his account of the experience.

An advantage claimed for the Neurological Impress Method is that the multi-sensory approach will help the child receive a stronger signal for learning through a visual-auditory-kinesthetic feedback system, thereby effecting a neurological change. Advantages of the Language Experience Approach are that the language of the child promotes interest, the words he supplies have meaning for him when he decodes them, the stress is on meaningful thought units, and word-by-word oral reading is discouraged.

Related Literature

Significance of the Problem. Until recently it has been estimated that disabled readers comprised approximately ten to fifteen percent of the school population

(Harris, 1961). More current reports indicate that one in every four students has a significant reading difficulty. About half of the unemployed young people today are functionally illiterate (Grannis, 1969).

Studies (Arnold, 1969; Robinson and Hanson, 1968) have substantiated Coleman's (1940) early findings that a positive relationship exists between socio-economic status and academic success of students. It is evident that reading disability is associated with low socio-economic status. The severity of the problem demands that effective remedial procedures be developed to help alleviate the widespread and unfortunate results of lack of learning.

The Neurological Impress Method. In the early 1960's R. G. Heckelman developed the Neurological Impress Method (NIM) for children with reading problems. In an article (Heckelman, 1966) that carefully describes the proper use of the method, it is claimed that the method makes economical use of time and money for materials and is highly effective as a remedial technique.

Evidence of the effectiveness of the NIM is extremely limited. Gains in reading were reported (Miller, 1969) on a case study of one nine-year-old boy. The method has been reported effective with certain clinic cases (Kaluger and Kolson, 1969). Heckelman reports on later cases "all of the remedial students seen . . . were able to increase their reading ability about three grade levels or more within three months." (Heckelman, 1969, p. 278).

As a result of his success in a clinical setting, Heckelman conducted a "controlled experiment" (Heckelman, 1969, p. 279). He used the NIM on 24 students in grades 7-10. The subjects were of average intelligence but were functioning three years or more below their expected reading capacity. Each child received the NIM for 15 minutes per day, 5 days per week, for 6 weeks. With 7 1/4 hours of instruction, a mean gain of 1.9 years was reported.

The impressive results reported by Heckelman are seriously flawed by a basic error in research design. The lack of a control treatment strongly suggests that the regression effect (Campbell and Stanley, 1963) was present and may have accounted for a good deal of the "growth" reported.

Hollingsworth (1970) developed an adaptation of the Heckelman NIM to eliminate the perceived problems

of requiring much teacher time to help several students and causing voice fatigue for the teacher. In the Hollingsworth experiment six children from fourth grade were divided into matched groups, one experimental and one control. The mean scores on reading pretests were at grade level, and intelligence scores were within the average range. The auditory reinforcement for the experimental group was provided by tapes used in an E.F.I. Wireless System. Each child read 10 stories a grade below his measured reading grade level, 10 stories at his measured level, and 10 stories a grade above his measured reading grade level. The teacher monitored the 8 children by plugging her headset into individual receiving sets. This monitoring was reported as quite successful. No treatment was described for the control group. After 7 1/2 hours of impress method work by the experimental children, both groups were posttested with an alternate form of the reading pretest. Analysis of variance revealed no significant differences between groups on the posttest. Possible explanations were the need for a 1:1 teacher-student ratio and the greater effectiveness of the NIM with remedial cases than in normal classroom use.

The Language Experience Approach. The Language Experience Approach (LEA) has been used for many years in regular classrooms. The results of empirical research have been conflicting as to the efficacy of the method for developmental reading. Hahn (1967) reported significantly higher scores for the LEA than for the basal reader program, on the Word Reading Test of the Stanford Achievement Test. Bond and Dykstra (1967) found few significant differences between the results of LEA and basal reader methods. The differences generally supported the former program but were of little practical significance as shown by reading achievement. In contrast, Harris and Serwer (1967) reported a slight but significant advantage for the basal reader program as 1 of 4 methods, including LEA, used in a comparative study. Neither Reid and Beltramo (1966) nor Robinson (1968) support one method over another.

Spieth (1967, 1968, 1969) reported on three experimental summer remedial reading programs, RISE I, RISE II, and RISE III, for first and second graders. The reports did not indicate whether any children participated in more than one RISE program. The programs compared methodologies based on LEA using Words In Color; Scott, Foresman basal readers; Sullivan programmed readers; and SRA Reading Laboratories, for effectiveness in increasing

reading ability, improving behavior in the classroom, increasing attention span, and improving eye-hand perceptual skills. Classes of fifteen children met for four hours a day.

In RISE I differences in achievement were not great among groups taught by different methodologies. LEA provided greater numerical gains in measured reading ability than any other method. Significant advantages ($p<.05$) for LEA appeared in the development of good behavior in the classroom, improvement in perceptual skill, and increase of attention span (Spieth, 1967).

The children's personality types were studied and categorized as problem behavior, lack of perceptual skills, shyness and withdrawal, or combinations of problems. Among the withdrawn children, second graders improved in reading more than first graders ($p<.05$). First graders made more progress than second graders in classroom behavior, perceptual skills, and attention span. LEA was the most effective methodology for withdrawn children, particularly for increasing attention span ($p<.05$) (Spieth, 1967).

RISE II (Spieth, 1968) was to test the usefulness of grouping children by personality types in order to provide every child with the teaching methodology shown by RISE I to be most effective. LEA was the methodology used with withdrawn children and with those having several problems. For the latter group of children, significant improvement over subjects in RISE I was reported for digit span and Bender-Gestalt Test results. Second graders were significantly better than their counterparts of RISE I when average reading scores were compared. Generally, the expectation of better learning as a result of appropriate instructional method for each child was not fulfilled. A third program was conducted to try to correct the lack of progress evidenced.

For RISE III, children of different personality types were deliberately mixed in the same classroom. Groupings for instruction were formed within the classroom on the basis of personality type, and children in each group were taught by the methodology found most appropriate in the earlier program. This arrangement seemed to provide the most satisfactory learning conditions. "All comparisons between RISE II and RISE III were significant at least at the .05 probability level and in the predicted direction" (Spieth, 1969, p. 102).

Measured reading growth of children using LEA was greater than the measured growth of children using other methods.

Grace Fernald (1943) reports using a technique very similar in many ways to LEA. In her study remedial cases reportedly made great strides in reading growth. It is generally accepted that the LEA in clinical settings has been an effective method for treating reading disability cases (Harris, 1970).

Summary

Very few studies of the use of the Neurological Impress Method (NIM) have been reported in the literature. Two reports were authored by the developer of the method, and a basic flaw in the design is considered a limitation of the research validating the method. One report of a study of children from typical classrooms revealed possible limitations from lack of one-to-one teacher-student use of the method. No differences between treatment and control groups were observed.

Reports of the Language Experience Approach (LEA) studies showed conflicting results from its use as an instructional technique in the classroom. Its use as a remedial technique has been seldom reported but widely accepted.

Rationale for the Present Study

For this study it was felt that the use of control subjects in community schools and two experimental methods in the Reading Clinic would provide multiple comparisons of effectiveness of methods, and would eliminate the weaknesses of previous studies.

On the basis of previous studies, differences in growth among NIM, LEA, and Control treatment groups in this study were hypothesized for oral reading and various reading subtests.

CHAPTER II

THE PROCEDURES AND THE EXPERIMENTAL DESIGN

Sample

The population for this study was drawn from a small city and adjacent rural communities within commuting distance of Purdue University. The socio-economic level is predominantly middle class, but all classes are found in the area.

All subjects were referred to the Purdue University Reading Clinic. The subjects considered for inclusion in this study were regular students in community schools. Their range of grade placement was from first grade through high school. The population included many more males than females.

Screening Procedures

All clients referred to the Reading Clinic from July 1970 through September, 1971, were screened for inclusion in the sample for this study. After their parents had completed appropriate application blanks and had signed permission forms (Appendix A) for their child to participate in research, subjects visited the Reading Clinic, and a clinic supervisor administered the screening instruments.

Criteria for Inclusion in the Study

Three criteria were set for acceptance into the study:

1. That the subjects attain an intelligence quotient of 80 or higher on either the Peabody Picture Vocabulary Test (PPVT) (Dunn, 1959) or Raven's Progressive Matrices (Raven's) (Raven, 1965).

2. That the subjects be considered serious reading disability cases, as indicated by the difference between the obtained grade score on the reading subtest of the Wide Range Achievement Test (WRAT) (Jastak, 1965) and

the child's actual grade placement. The necessary differences for various grade placements, recommended by Kaluger and Kolson (1969, p. 48), can be seen in Table 1.

3. That the subjects have no known primary disability such as emotional disturbance or neurological deficit which would seriously impair learning.

Table 1

Criteria for Classification as Disabled Readers

Grades	Behind in Reading
1,2	3-6 months
3,4	6-8 months
5,6	9 months - 1 year
Junior High	1 year - 1 1/2 years
Senior High	1 1/2 years - 2 years

Selection and Assignment of Subjects

A total of 63 children were screened for this study. Of these 63 candidates, 23 children were not included in the study because they did not meet the criteria for acceptance. Those 40 who met the established criteria were then randomly assigned to one of three treatments.

The distribution of clients accepted for the study is shown in Table 2. Due to various reasons, incomplete data were obtained for eight subjects. Thus a total of 32 subjects furnished the data reported in this study. Ten subjects completed the NIM treatment, thirteen subjects completed the LEA treatment, and nine subjects completed the Control treatment.

Table 2

Distribution of Clients Accepted for Study

NIM	LEA	Control
Total Admitted and Assigned		
15	15	10
Total Treated		
10	13	9

Selection and Training of Tutors

Every subject included in this study received remedial teaching from one assigned tutor.

Tutors used in this study were students enrolled in Education 536, Foundations of Remedial Reading, the first course in a three-course sequence to prepare remedial reading teachers. As a part of the course requirements, students participate in a three hour laboratory experience in the Reading Clinic, tutoring a child three days a week. To eliminate any possible bias of tutors, they were randomly assigned to either the NIM or the LEA condition. Since Control subjects were not seen at the Reading Clinic, no tutors were involved in the Control condition.

All tutors were trained in both experimental procedures and instructed to use only that procedure to which they were assigned. They were further instructed not to use any procedure which might conflict with their assigned method. Tutors were supervised and told to ask for help if a particular activity was doubtful to them.

Instrumentation

Every subject in this study was administered five standardized measures. Three measures were administered

by a clinic supervisor for screening purposes. Two criterion measures of pre-post experimental gain were administered, one in oral reading by a clinic supervisor, and one for silent reading by the assigned tutor.

Screening Measures. The Wide Range Achievement Test (WRAT) (Jastak, Jastak, and Bijou, 1965) is an individual test of reading (word recognition and pronunciation), written spelling, and arithmetic computation. Its purpose, according to the manual, is to provide an assessment of achievement as an adjunct to intelligence and behavior adjustment tests. The standardization sample was widely distributed over the United States. Validity of WRAT scores is shown by correlations with both school grades (.78 to .88) and results of individual intelligence tests (.66 to .84). Reliability coefficients are given for each subtest and age group (not less than .940 for any age group). This instrument has been favorably reviewed (Buros, 1949, 1965).

The Peabody Picture Vocabulary Test (PPVT) (Dunn, 1959) is an individual test of intelligence. Its general purpose is to estimate verbal intelligence by assessing hearing vocabulary. The PPVT may be used with persons from age 2.5 to age 18.

The final standardization group included 4,012 white children and youth residing in and around Nashville, Tennessee. The subjects were chosen to represent normal distributions of intelligence as determined by scores on the Kuhlmann-Finch Intelligence Test. Mean Test Age was used to determine age norms for raw scores obtained on the test.

Statistical validity is reported in the manual. PPVT scores increased with the age of the subject, correlate with Wechsler more than with Binet I.Q.'s, and are fairly related to school achievement. Reliability as reported in the manual ranges from 0.67 to 0.84. Reviewers (Buros, 1965) have commented favorably about this instrument.

Both forms of Raven's Progressive Matrices (Raven's) (Raven, 1960, 1965) provide estimates of nonverbal intelligence. Their purpose is to supplement vocabulary tests with perceptual tasks for subjects of all ages. The instruments were standardized on British populations. Descriptions of validity and reliability are provided in the manuals. Reviews (Buros, 1949, 1953, 1959, 1965) stress the usefulness of this instrument for subjects with communication difficulties.

Criterion Measure of Oral Reading. The pretest-posttest measure of oral reading accuracy was the oral reading subtest of the Gates-McKillop Reading Diagnostic Tests (RDT) (Gates, McKillop, 1952). The same form was used for pretest and posttest. This instrument is a revision of the Gates Reading Diagnostic Tests (Gates, 1926) which were standardized on a group of third graders of widely varied home and cultural backgrounds. The children were attending one New York City school. The manual lacks specific data on reliability and validity. The test is widely used, and the oral reading subtest appears to have face validity. This instrument has been favorably reviewed in the Mental Measurements Yearbook (Burros, 1949, 1953, 1959, 1965).

Criterion Measures of Silent Reading. The New Developmental Reading Tests (Bond, Balow, Hoyt, 1968) (NDRT) were used to assess pre-post experimental gain in silent reading and comprehension. This instrument has been favorably reviewed (Buros, 1972).

The Primary level tests were standardized on more than 5000 children in stratified randomized samples from two large midwestern communities. Validity was established by verification of grade placement using other reading tests. Reliability was shown by correlation coefficients between .89 and .95, calculated from between-form scores.

The Primary level tests were used with 21 subjects in this study. Subtest scores thus obtained were the dependent variables Vocabulary, Comprehending Significant Ideas, Comprehending Specific Instructions, Literal Comprehension, and Average Reading.

The Intermediate level tests were standardized on 15,000 pupils in learning centers of wide geographical distribution over the United States. Item validity was shown by point-biserial correlations clustering mostly between .30 and .54. Reliability coefficients based on internal consistency ranged from .83 to .94.

The Intermediate level tests were used with 11 subjects in this study. Subtest scores thus obtained were the dependent variables Vocabulary, Reading for Information, Reading for Relationships, Literal Comprehension, Reading for Interpretation, Reading for Appreciation, Creative Comprehension, General Comprehension, and Average Reading.

Treatments

Clinical Procedures. Tutors and subjects working in the Reading Clinic used their assigned experimental method and other non-conflicting methods and materials to remediate the subjects' reading problems.

The Neurological Impress Method (NIM) involved the tutor's reading orally with the child as both pointed with index fingers to the words being read. The tutor was to read slightly faster than the subject's usual oral reading rate. According to Heckelman, the tutor would provide a model of fluent oral reading and reinforce the subject's word recognition. The fingers would help focus visual attention on the word being read and provide large muscle reinforcement for eye movements. No attention was given to comprehension unless the subject asked questions, as prescribed by Heckelman (1966, 1969).

The Language Experience Approach (LEA) involved the tutor's writing the subject's dictated accounts of experiences. These stories served as text from which the subject learned to read. The subject would learn to recognize his own words in other settings. The child would be reading about a topic of interest to him. The reading vocabulary would be meaningful thought-unit phrasing rather than mere word-calling, as emphasized by Lee and Allen (1963).

Fifteen minutes of each tutoring session were devoted to the experimental treatment. The remaining time was devoted to other reading tasks which were considered non-interfering with the experimental treatment. Non-interfering tasks included such activities as building sight vocabulary and developing word analysis and comprehension skills.

Remediation was conducted at the instructional and independent reading levels as determined by Informal Reading Inventories (Johnson and Kress, 1965) administered to each subject by his assigned tutor. Informal Reading Inventories were prepared from basal reading materials in the Purdue Reading Clinic. Each subject read words in isolation and paragraphs. Accuracy of oral reading and comprehension were evaluated to determine grade levels at which the subject could read independently and with tutor assistance. Criteria for evaluating performance were those of Johnson and Kress (1965). The frustration reading level was carefully avoided by each tutor.

Each tutor was supervised by the writer and by supervisors working in the Reading Clinic. Tutors received individual consultations regarding their clients during the experimental period. Materials for instruction were high interest, low vocabulary trade books, tutor-made exercises, and other materials available in the Reading Clinic.

Control Treatment Procedure. After the initial screening, Control Treatment subjects received no remediation in the Reading Clinic. However, these subjects did receive training as part of regular classroom instruction. This treatment group was included primarily to determine the possible effect of regression to the mean frequently involved in the study of below average performers (Campbell and Stanley, 1964).

Treatment Period. Subjects were included in the study during two fall semesters, one spring semester, and one summer session. Each subject was included in the study for only one term.

Each subject in the NIM and LEA groups was scheduled to attend the Purdue Reading Clinic three times per week for the semester, to receive approximately 35 tutoring hours in fall and spring terms and 23 hours in the summer session. Tutoring sessions were 50 minutes in length in the fall and spring, 60 minutes in summer.

The mean number of hours of remediation for each group is listed in Table 3. Most of the difference in treatment time was due to absence of the subject, an uncontrolled factor in this study.

Table 3

Hours of Treatment Received by Each Group

Treatment	NIM	LEA	Control (Estimates)
	Total Instruction		
Range	17-29 1/6	13-25	0-90
Mean	24	30	26
	Experimental Treatment		
Range	4 1/2-8 3/4	3 1/4-10 1/2	Unknown but
Mean	7	6 1/2	probably 0

Attendance records of subjects in the NIM and LEA treatment groups indicated the number of lessons the subjects received. Since the Control subjects were not seen in the Reading Clinic except for screening purposes, no data were available on the exact amount of remedial help available to those subjects. In order to determine this as closely as possible, questionnaires (Appendix B) were sent to parents and teachers of the Control subjects to ascertain the amount of special reading help given during the experimental period. The questionnaires were sent after each treatment period and the returns were 100%.

Experimental Design

Analysis. The basic design involved a comparison of the control and the two experimental groups on twelve scores. Direct scores were obtained for eight subtests, and four more by combining two or more subtests. Difference scores from pre- to posttest were calculated for each of the dependent variables.

Descriptions of the range, mean, and standard deviation of the final scores were obtained using Program DISTAT from the EDSTAT series (Veldman, 1969).

Determination of covariates (Elashoff, 1971) was from correlation matrices obtained by using BMD 3D of the Biomedical Program Series from the University of California School of Medicine.

The covariates determined from the correlation Matrices were Raven's IQ equivalent, WRAT spelling raw score, and chronological age.

The principal analytical form was analysis of covariance (Weiner, 1971) on the posttest scores. The method used was "BMDO 4V - Analysis of Covariance - Multiple Covariates - Version of April 1, 1966," (Dixon, 1970).

Null Hypotheses

The principal hypotheses of the study were as follows:

Among the NIM, LEA, and Control treatment groups, when scores are adjusted for the effects of the covariates, there will be no differences in scores of:

a) Oral Reading,
b) Vocabulary,
c) Average Reading,
d) Literal Comprehension,
e) Reading for Information,
f) Reading for Relationships,
g) Reading for Interpretation,
h) Reading for Appreciation,
i) Creative Comprehension,
j) General Comprehension,
k) Comprehending Significant Ideas, or
l) Comprehending Specific Instructions.

Summary

The population for this study were school children living within commuting distance of Purdue University and referred to the Purdue Reading Clinic for help with reading problems. The subjects were screened to meet criteria established for the study and were randomly assigned to the Neurological Impress Method, the Language Experience Approach, or the Control treatment.

The tutors, enrolled in the first of three graduate courses in remedial reading, were also randomly assigned to either the NIM or the LEA treatment. They were trained in the experimental and other instructional methods and supervised in their use of remedial procedures.

Each subject was included in the study for one Purdue semester or summer session. Reading progress of subjects was measured with oral and silent reading subtests. Analysis of covariance was used to test the statistical significance of differences in scores attained by the three treatment groups.

CHAPTER III

FINDINGS AND ANALYSES

Results of this study are presented as statistical analyses and descriptive statistics.

Statistical analyses are based on both pretest scores and posttest scores. Pretest scores were used to determine the covariates, and posttest scores were analyzed by Analysis of Covariance.

The first descriptive statistics provided are based on posttest scores from the criterion measures, Gates-McKillop Reading Diagnostic Tests (RDT) and the New Developmental Reading Tests (NDRT) by Bond, Balow, and Hoyt. Descriptive statistics based on pre-posttest difference scores are also included.

Determination of Covariates

Determination of covariates was based on pretest scores with correlations of .3 or higher (Elashoff, 1971). The correlation matrix presented in Table 4 was obtained using BMD 3D of the Biomedical Program Series from the University of California School of Medicine (Dixon, 1970). The covariates so determined were Raven's IQ equivalent score, WRAT Spelling raw score, and chronological age.

Computer Programs for Posttest Scores

The descriptive statistics presented in this section were obtained using Program DISTAT from the EDSTAT series (Veldman, 1969). Analyses of Covariance (Weiner, 1971) were computed by "BMDO 4V - Analysis of Covariance-Multiple Covariates - Version of April 1, 1966" (Dixon, 1970).

Analyses of Posttest Scores

In Table 5 the ranges, means, and standard deviations of RDT Oral Reading raw scores are presented by treatment groups. The highest mean score (11.3) was

TABLE 4

Correlation Coefficients of Pre-Test Variables

	Treatment	Peabody	Raven	WRAT Rdg.	WRAT Sp.	WRAT Math	Age	Gates Pre	Vocab. Pre	Avg. Rdg. Pre	Literal Comp. Pre	Rdg. for Information	Rdg. for Relationships	Rdg. for Interpretation	Rdg. for Appreciation	Creative Comprehension Pre	General Comprehension Pre	Rdg. for Significant Ideas Pre	Specific Instructions Pre
Sex	.2379	-.1784	.0656	.2657	.2128	.3095	.0124	.2561	-.0329	-.0205	.0981	.0000	.0000	.0000	.0000	.0000	.0000	.4099	.2897
Treatment		.1328	.0088	.3439	.3352	.3379	.0303	.1507	-.0282	-.2384	.1054	.0460	.0795	.1256	-.0579	.0209	.0871	.2699	.2680
PPVT IQ			.0721	.4548	.1076	.3422	-.0744	-.0428	.3314	-.1535	.2420	.1072	.0760	.4578	.4994	.4772	.3283	.5293	.1327
Raven's IQ				-.0661	-.1601	.0045	.1058	-.2391	.1950	-.1288	.2353	.4226	.4664	.4987	.6941	.6107	.5576	.1203	.0657
WRAT Reading					.7769	.7812	-.2932	.3007	.0701	-.5097	-.0165	-.6607	-.5246	-.2774	-.2118	-.2388	-.4195	.6165	.5065
WRAT Spelling						.8153	-.6236	.1738	-.6187	-.4666	-.3853	-.7154	-.4850	-.3281	-.3406	-.3383	-.4614	.1692	.1006
WRAT Math							-.5210	.0183	-.2857	-.4881	-.2573	-.4931	-.5121	-.2085	-.1448	-.1725	-.3089	.3568	.1785
Age								.1411	.7428	.4386	.0589	.5856	.4892	.1993	.2795	.2449	.3735	.2065	.4118
Gates Pre									.1248	.2068	.2007	.3967	-.1587	-.2966	-.3208	-.3179	-.3207	.6885	.7482
Vocab. Pre										.2754	.8294	.6474	.5200	.7102	.7618	.7508	.6744	.8187	.8287
Avg. Rdg. Pre											.2329	.8556	.7859	.9036	.9543	.9373	.9155	-.0213	.2458
Lit. Comp.												.9670	.9461	.8270	.8473	.8561	.8547	.9499	.9459
Rdg. for Information													.8488	.7966	.8053	.8186	.9158	.0000	.0000
Rdg. for Relationships														.7807	.8122	.8147	.9054	.0000	.0000
Rdg. for Interpretation															.9329	.9770	.9484	.0000	.0000
Rdg. for Appreciation																.9871	.9516	.0000	.0000
Creative Comprehension																	.9685	.0000	.0000
General Comprehension																		.0000	.0000
Rdg. for Significant Ideas																			.8825
Specific Instructions																			

attained by the Control treatment group, the second highest mean score (10.4) was attained by the LEA treatment group, and the lowest mean score was attained by the NIM treatment group.

Table 5

Descriptive Statistics for New Developmental Reading Tests Reading Diagnostic Posttest Scores

Treatment	NIM	LEA	Control
Range	1.1-15.1	1.3-20.8	3.8-20.8
Mean	9.1	10.4	11.3
St. Dev.	7.0	6.8	7.2
N	10	13	9

The results of Analysis of Covariance of RDT Oral Reading raw scores are presented in Table 6. The differences in means among the treatment groups were statistically nonsignificant.

Table 6

Results of Analysis of Covariance for Reading Diagnostic Tests Oral Reading Posttest Raw Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	518.9300	.132	N.S.
Error	26	3922.1076		

In Table 7 the ranges, means, and standard deviations of the NDRT Vocabulary grade scores are presented by treatment groups. The higher mean score (4.5) was attained by the Control treatment group, and the lower mean

score (4.1) was attained by both the LEA and the NIM treatment groups.

Table 7

Descriptive Statistics for New Developmental Reading Tests Vocabulary Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	1.7-10.2	1.7-7.1	1.3-8.4
Mean	4.1	4.1	4.5
St. Dev.	2.6	1.5	2.1
N	10	13	9

The results of Analysis of Covariance of the NDRT Vocabulary grade scores are presented in Table 8. The differences in means among the treatment groups were statistically nonsignificant.

Table 8

Results of Analysis of Covariance for New Developmental Reading Tests Vocabulary Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	268.2232	1.090	N.S.
Error	26	245.9975		

In Table 9 the ranges, means, and standard deviations of NDRT Average Reading grade scores are presented by treatment groups. The highest mean score (4.8) was attained by the Control treatment group, the second highest mean score (4.1) was attained by the LEA treatment group, and the lowest mean score (4.0) was attained by the NIM treatment group.

Table 9

Descriptive Statistics for New Developmental Reading Tests Average Reading Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	1.9-9.1	1.5-8.0	1.9-9.2
Mean	4.0	4.1	4.8
St. Dev.	2.2	1.6	2.2
N	10	13	9

The results of Analysis of Covariance of NDRT Average Reading grade scores are presented in Table 10. The differences in means among the treatment groups were statistically nonsignificant.

Table 10

Results of Analysis of Covariance for New Developmental Reading Tests Average Reading Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	333.5846	1.445	N.S.
Error	26	230.8489		

In Table 11 the ranges, means, and standard deviations of NDRT Literal Comprehension grade scores are shown by treatment groups. The highest mean score (4.8) was attained by the Control treatment group, the second highest mean score (4.2) was attained by the LEA treatment group, and the lowest mean score (3.6) was attained by the NIM treatment group.

Table 11

Descriptive Statistics for New Developmental Reading Tests Literal Comprehension Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	1.9-6.4	1.9-8.3	2.0-9
Mean	3.6	4.2	4.8
St. Dev.	1.5	1.7	2.2
N	10	13	9

The results of Analysis of Covariance of the NDRT Literal Comprehension grade scores are shown in Table 12. The differences in means among the treatment groups were statistically nonsignificant.

Table 12

Results of Analysis of Covariance for New Developmental Reading Tests Literal Comprehension Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	264.1172	1.233	N.S.
Error	26	214.1670		

In Table 13 the ranges, means, and standard deviations of NDRT Reading for Information grade scores are presented by treatment groups. The highest mean score (6.1) was attained by the NIM treatment group, the second highest mean score (5.4) was attained by the Control treatment group, and the lowest mean score (5.2) was attained by the LEA treatment group.

Table 13

Descriptive Statistics for New Developmental Reading Tests Reading for Information Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	5.4-6.8	3.6-7.6	0.1-8.6
Mean	6.1	5.2	5.4
St. Dev.	0.7	1.6	3.8
N	3	5	3

The results of Analysis of Covariance of the NDRT Reading for Information grade scores are presented in Table 14. The differences in means among the treatment groups were statistically nonsignificant.

Table 14

Results of Analysis of Covariance for New Developmental Reading Tests Reading for Information Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	406.6259	2.176	N.S.
Error	26	186.8400		

In Table 15 the ranges, means, and standard deviations of NDRT Reading for Relationships grade scores are listed by treatment groups. The highest mean score (6.5) was attained by the Control treatment group, the second highest mean score (6.3) was attained by the NIM treatment group, and the lowest mean score (5.8) was attained by the LEA treatment group.

Table 15

Descriptive Statistics for New Developmental Reading Tests Reading for Relationships Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	6.1-6.8	3.7-8.6	4.7-9.6
Mean	6.3	5.8	6.5
St. Dev.	0.4	2.0	2.7
N	3	5	3

The results of Analysis of Covariance of the NDRT Reading for Relationships grade scores are listed in Table 16. The differences in means among the treatment groups were statistically nonsignificant.

Table 16

Results of Analysis of Covariance for New Developmental Reading Tests Reading for Relationships Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	274.7387	.862	N.S.
Error	5	318.8648		

In Table 17 the ranges, means, and standard deviations of the NDRT Reading for Interpretation grade scores are presented by treatment groups. The highest mean score (7.4) was attained by the Control treatment group, the second highest mean score (6.9) was attained by the NIM treatment group, and the lowest mean score (5.5) was attained by the LEA treatment group.

Table 17

Descriptive Statistics for New Developmental Reading Tests Reading for Interpretation Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	4.5-8.9	3.7-8.7	6.1-9.7
Mean	6.9	5.5	7.4
St. Dev.	2.3	2.0	2.0
N	3	5	3

The results of Analysis of Covariance of the NDRT Reading for Interpretation grade scores are presented in Table 18. The differences in means among the treatment groups were statistically nonsignificant.

Table 18

Results of Analysis of Covariance for New Developmental Reading Tests Reading for Interpretation Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	506.4097	1.665	N.S.
Error	5	304.1003		

In Table 19 the ranges, means, and standard deviations of the NDRT Reading for Appreciation grade scores are shown by treatment groups. The highest mean score (8.0) was attained by the Control treatment group, the second highest mean score (7.9) was attained by the NIM treatment group, and the lowest mean score (5.3) was attained by the LEA treatment group.

Table 19

Descriptive Statistics for New Developmental Reading Tests Reading for Appreciation Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	7.1-9.5	2.7-9.6	5.5-10.6
Mean	7.9	5.3	8.0
St. Dev.	1.4	2.6	2.5
N	3	5	3

The results of Analysis of Covariance of the NDRT Reading for Appreciation grade scores are shown in Table 20. The differences in means among the treatment groups were statistically nonsignificant.

Table 20

Results of Analysis of Covariance for New Developmental Reading Tests Reading for Appreciation Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	1359.4242	3.195	N.S.
Error	5	425.5118		

In Table 21 the ranges, means, and standard deviations of the NDRT Creative Comprehension grade scores are presented by treatment groups. The highest mean score (7.7) was attained by the Control treatment group, the second highest mean score (7.3) was attained by the NIM treatment group, and the lowest mean score (5.0) was attained by the LEA treatment group.

Table 21

Descriptive Statistics for New Developmental Reading Tests Creative Comprehension Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	5.8-9.0	3.2-8.9	5.8-10.4
Mean	7.3	5.0	7.7
St. Dev.	1.6	2.3	2.3
N	3	5	3

The results of Analysis of Covariance of the NDRT Creative Comprehension grade scores are presented in Table 22. The differences in means among the treatment groups were statistically nonsignificant.

Table 22

Results of Analysis of Covariance for New Developmental Reading Tests Creative Comprehension Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	1020.7729	2.873	N.S.
Error	5	355.2651		

In Table 23 the ranges, means, and standard deviations of the NDRT General Comprehension grade scores are shown by treatment groups. The highest mean score (7.5) was attained by the Control treatment group, the second highest mean score (6.9) was attained by the NIM treatment group, and the lowest mean score (5.0) was attained by the LEA treatment group.

Table 23

Descriptive Statistics for New Developmental Reading Tests General Comprehension Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	6.1-8.1	3.2-8.9	5.5-10.2
Mean	6.9	5.0	7.5
St. Dev.	1.0	2.3	2.4
N	3	5	3

The results of Analysis of Covariance of the NDRT General Comprehension grade scores are shown in Table 24. The differences in means among the treatment groups were statistically nonsignificant.

Table 24

Results of Analysis of Covariance for New Developmental Reading Tests General Comprehension Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	720.0498	2.184	N.S.
Error	5	329.6595		

In Table 25 the ranges, means, and standard deviations of the NDRT Comprehending Significant Ideas grade scores are listed by treatment groups. The highest mean score (3.7) was attained by the Control treatment group, the second highest mean score (3.5) was attained by the LEA treatment group, and the lowest mean score (3.1) was attained by the NIM treatment group.

Table 25

Descriptive Statistics for New Developmental Reading Tests Comprehending Significant Ideas Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	2.5-5.2	1.6-5.2	1.9-5.2
Mean	3.1	3.5	3.7
St. Dev.	1.1	1.3	1.2
N	7	8	6

The results of Analysis of Covariance of the NDRT Comprehending Significant Ideas grade scores are listed in Table 26. The differences in means among the treatment groups were statistically nonsignificant.

Table 26

Results of Analysis of Covariance for New Developmental Reading Tests Comprehending Significant Ideas Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	8.3255	.054	N.S.
Error	15	154.8494		

In Table 27 the ranges, means, and standard deviations of the NDRT Comprehending Specific Instructions grade scores are presented by treatment groups. The highest mean score (3.8) was attained by the Control treatment group, the second highest mean score (3.6) was attained by the LEA treatment group, and the lowest mean score (3.1) was attained by the NIM treatment group.

Table 27

Descriptive Statistics for New Developmental Reading Tests Comprehending Specific Instructions Posttest Grade Scores

Treatment	NIM	LEA	Control
Range	2.5-5.2	2.1-5.1	2.3-5.1
Mean	3.1	3.6	3.8
St. Dev.	1.1	1.1	1.1
N	7	8	6

The results of Analysis of Covariance of the NDRT Comprehending Specific Instructions grade scores are presented in Table 28. The differences in means among the treatment groups were statistically nonsignificant.

Table 28

Results of Analysis of Covariance for New Developmental Reading Tests Comprehending Specific Instructions Posttest Grade Scores

Source	Degrees of Freedom	Mean Square	F	p
Treatment	2	30.1140	.274	N.S.
Error	15	110.0907		

In Table 29 the mean posttest scores for all dependent variables are presented by treatment groups. The NIM treatment group attained the highest mean score on one subtest, NDRT Reading for Information, and the Control treatment group attained the highest mean scores for all other subtests. None of the differences among groups were statistically significant.

Table 29

Summary of Dependent Variable Posttest Mean Scores, by Treatment Groups

Variable	NIM Treatment	LEA Treatment	Control Treatment	F Value
RDT Oral Reading	9.1	10.4	11.3	N.S.
NDRT Vocabulary	4.1	4.1	4.5	N.S.
NDRT Average Reading	4.0	4.1	4.8	N.S.
NDRT Literal Comprehension	3.6	4.2	4.8	N.S.
NDRT Reading for Information	6.1	5.2	5.4	N.S.
NDRT Reading for Relationships	6.3	5.8	6.5	N.S.
NDRT Reading for Interpretation	6.9	5.5	7.4	N.S.
NDRT Reading for Appreciation	7.9	5.3	8.0	N.S.
NDRT Creative Comprehension	7.3	5.0	7.7	N.S.
NDRT General Comprehension	6.9	5.0	7.5	N.S.
NDRT Comprehending Significant Ideas	3.1	3.5	3.7	N.S.
NDRT Comprehending Specific Instructions	3.1	3.6	3.8	N.S.

Description of Pre-Posttest Difference Scores

The descriptive statistics for difference scores were obtained using Program DISTAT from the EDSTAT series (Veldman, 1969).

These scores were not subjected to analysis because of statistical difficulties associated with difference scores. Regression to the mean frequently occurring among subjects originally scoring at the extremes of an instrument's range is one such effect. The ceiling and floor effects of tests designed for particular ability levels also make difference scores less useful for comparing groups within a study than are posttest scores adjusted for the effects of covariates. Mean difference scores are included here for comparison with other studies.

In Table 30 the mean difference scores for all dependent variables are presented by treatment groups. The NIM treatment group attained the highest mean difference scores on four measures: the Reading for Interpretation, Creative Comprehension, General Comprehension, and Comprehending Significant Ideas subtests. The LEA treatment group attained the highest mean difference score on three measures: the Oral Reading, Reading for Relationships, and Comprehending Specific Instructions subtests. The LEA and Control Treatment groups attained the higher mean difference score for Literal Comprehension. The Control treatment group attained the highest mean difference score on four measures: the Vocabulary, Average Reading, Reading for Information, and Reading for Appreciation subtests.

Summary

This chapter has presented descriptive statistics and results of analyses of covariance for posttest scores adjusted for the effects of the covariates. Mean difference scores were also presented. None of the differences among treatment groups were statistically significant.

Table 30

Pre-Posttest Difference Scores,
by Treatment Groups

Variable	Test Level	NIM Treatment	LEA Treatment	Control Treatment
RDT Oral Reading	Primary & Intermediate	1.0	3.4	2.9
NDRT Vocabulary	Primary & Intermediate	.3	- .2	.5
NDRT Average Reading	Primary & Intermediate	.4	.2	.6
NDRT Literal Comprehension	Primary & Intermediate	.4	.6	.6
NDRT Reading for Information	Intermediate	1.1	.4	1.3
NDRT Reading for Relationships	Intermediate	1.0	1.1	.6
NDRT Reading for Interpretation	Intermediate	1.3	.6	.5
NDRT Reading for Appreciation	Intermediate	1.8	.5	2.0
NDRT Creative Comprehension	Intermediate	1.5	.2	1.4
NDRT General Comprehension	Intermediate	1.5	.4	1.2
NDRT Comprehending Significant Ideas	Primary	.6	.4	.2
NDRT Comprehending Specific Instructions	Primary	.4	.6	.4

CHAPTER IV

CONCLUSIONS AND RECOMMENDATIONS

Conclusions

Although growth in reading was evidenced in all treatment groups, statistically significant differences between the three groups were not revealed when the data were submitted to analyses of covariance. None of the twelve analyses revealed statistically significant differences. The null hypotheses of this study are therefore not rejected. It can be concluded that neither the NIM nor the LEA nor the Control treatment was a more effective instructional procedure than either of the others.

Discussion

The mean difference scores attained by subjects in the NIM treatment in this study (.3-1.8) were lower than the gains reported by Heckelman (1.9-3.0±). The mean difference scores attained by the LEA (-.2 to 1.1) and Control (.2 to 2.0) treatments in this study also were generally lower than the gaines reported by Heckelman. These data suggest that the Neurological Impress Method is an effective treatment procedure but may cast some doubt on the original claims made by Heckelman.

This study included subjects of different ages from the subjects in Heckelman's studies. The relatively high ($\bar{X}$ = .40) correlation coefficients between age and reading achievement obtained in this study may have contributed to the differences in gain scores from this study and from Heckelman's reports.

The other covariates used in this study might have had an effect similar to that of chronological age in confounding the problems of direct comparison between the results of this study and the results reported by Heckelman. The lower limit of intelligence was 80 for this study and 90 for the Heckelman studies. Achievement in spelling was not considered by Heckelman but was included in this study.

It is felt that the value of the NIM procedure as demonstrated by this study, by Heckelman's studies, and

by Miller's study, is important. The writer is aware of other case studies involving NIM that have reported this procedure as effective for remediating problems of disabled readers. It is believed that in light of the findings from research studies, gains in nonempirical cases should not be ignored.

Limitations

Space restrictions in the Purdue University Reading Clinic facilities limited the size of the sample. This small sample size may be a limitation of the study because statistical tests require much greater differences among small groups than among large groups to reach significance.

The $15.00 application fee and $25.00 remediation fee required from parents of clients in the Purdue University Reading Clinic limited this study to subjects from socioeconomic status groups able to pay the fees. This restriction in the sample limits the population to which results of this study may be generalized.

The differences in regularity of attendance among Reading Clinic clients were an uncontrolled factor in the study. Students receiving less instruction because of less attendance may have depressed the mean scores for the groups.

Neither time nor methods of reading instruction at school are known for the subjects in the experimental treatments. This lack of control over reading instruction provided outside of the Reading Clinic may also limit the credibility of treatment effects for this study.

Practice effects of repeating the same form of oral and silent reading tests may have contributed to error of measurement within the study.

Educational Implications

The primary implication of this study is that for disabled readers in general, there is probably no one best method of instruction. This implication is consistent with results of many studies involving typical school populations.

A further implication is that a teaching method apparently very effective for selected individuals may

not be similarly helpful for a larger group of children.

Recommendations

A recommendation for further research is that treatment be based on differential diagnosis. Such factors as learning modalities and personality characteristics may be important determinants of treatment procedure.

A second recommendation for future research is that attempts be made to control the level of teaching proficiency of tutors. It is suspected that tutors having completed a semester of remedial teaching in a clinical setting will be more effective than teachers without clinical experience.

It is recommended that future researchers control for the ages of disabled readers. In this study the relatively high correlation of chronological age with reading achievement was an unanticipated outcome.

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APPENDIX A

QUESTIONNAIRE

Dear

Your child, even though he has not been in our clinic this past semester, has been involved in a research study. We are trying to determine if treatment at our clinic is worthwhile.

We need the following information about your child last semester:

A) To the best of your knowledge, did your child receive reading instruction other than he regularly receives in his school classroom?

Yes____ No____

B) If you answered yes, please answer the following questions.

1. Did he receive private tutoring?

Yes____ No____

How much time did this involve? (e.g., 1 hour per week, 1/2 hour per day)

____hour per ____

2. Did he receive any other special help in reading? Yes____ No____ If so, please describe below and indicate the amount of time involved?

_____

_____

A copy of this questionnaire is also being sent to your child's teacher, who may be helpful in giving us more "teacher-type" information. The teacher will probably fill in this section.

3. Did your child receive remedial reading at achool? Yes____ No____ How much time was involved? ____ hour per ____

4. Did he receive any special help in reading at school? Yes____ No____ How much time was involved? ____ hour per ____

Your prompt and honest response is urgently needed.

Thank you for your cooperation.

Yours truly,

Richard D. Arnold
Associate Professor of
Education

APPENDIX B

PERMISSION FORM

One of the primary purposes of the Remedial Reading Clinic of the Purdue Achievement Center for Children is to provide training and experience to students. Their training is advanced by working with and observing children. In addition, the Center works closely with other professional agencies in order to provide the most effective diagnostic, remedial, and consultative services. In order for us to fulfill our responsibilities both to students and to other professional agencies, we request that you read the following statement and sign your name below:

* * * * *

We hereby permit the faculty, staff, and students of the Purdue Achievement Center for Children to test, to observe, to provide remedial assistance, and in other ways work with our child; to video-tape and audio-tape any of the above activities as well as parent and case conferences.

Also, we hereby permit the Purdue Achievement Center for Children to acquire from and/or release to other professional agencies (schools, clinics, doctors, etc.) any and all records and information pertaining to our child.

_____